

**WE CLAIM:**

1. A method for producing an *in-situ* composite solder having an intermetallic phase comprising the steps of:
  - a) combining a solder with the components of the intermetallic phase to form a mixture;
  - 5 b) heating the mixture of step a) to form a non-solid;
  - c) rapidly cooling the mixture of step b).
2. The method of Claim 1 where the solder matrix is a lead-free eutectic solder.
3. The method of Claim 1 where the solder matrix is a binary eutectic solder.
4. The method of Claim 1 where the solder matrix is a ternary eutectic solder.
5. The method of Claim 1 where the solder matrix is a near-eutectic solder.
6. The method of Claim 1 where the eutectic solder matrix is 96.5 Sn/3.5 Ag.
7. The method of Claim 1 where the intermetallic phase comprises about 20 volume % of the composite solder.
8. The method of Claim 1 where the intermetallic phase comprises one of the elements of the eutectic solder and a transition metal.
9. The method of Claim 1 where the intermetallic phase comprises  $\text{Cu}_6\text{Sn}_5$ .
10. The method of Claim 1 where the intermetallic phase comprises  $\text{Ni}_3\text{Sn}_4$ .
11. The method of Claim 1 where the intermetallic phase comprises  $\text{FeSn}_2$ .

12. The method of Claim 1 where the mixture is heated to a temperature greater than the highest melting point of any of the individual mixture components.

13. The method of Claim 1 where the mixture is rapidly cooled by splat quenching.

14. The method of Claim 1 where the mixture is rapidly cooled by spray atomization.

15. The method of Claim 1 where the mixture is rapidly cooled by continuous casting into a solid form.

16. The method of Claim 1 where the non-solid mixture of step b) is cooled to form a solid and then heated to form a non-solid, prior to the rapid cooling of step c).

17. A solder produced by the method of Claim 1.

18. The solder of Claim 17 comprising an intermetallic phase with particles less than about 10 microns.

19. The solder of Claim 17 comprising an intermetallic phase with particles less than about 2 microns.